WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

and

FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
MAR. 1, 1969

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85205
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80521
Idoho	P. O. Box 38, Boise, Idaho 83707
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Washingtan	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 340, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

MARCH 1, 1969

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

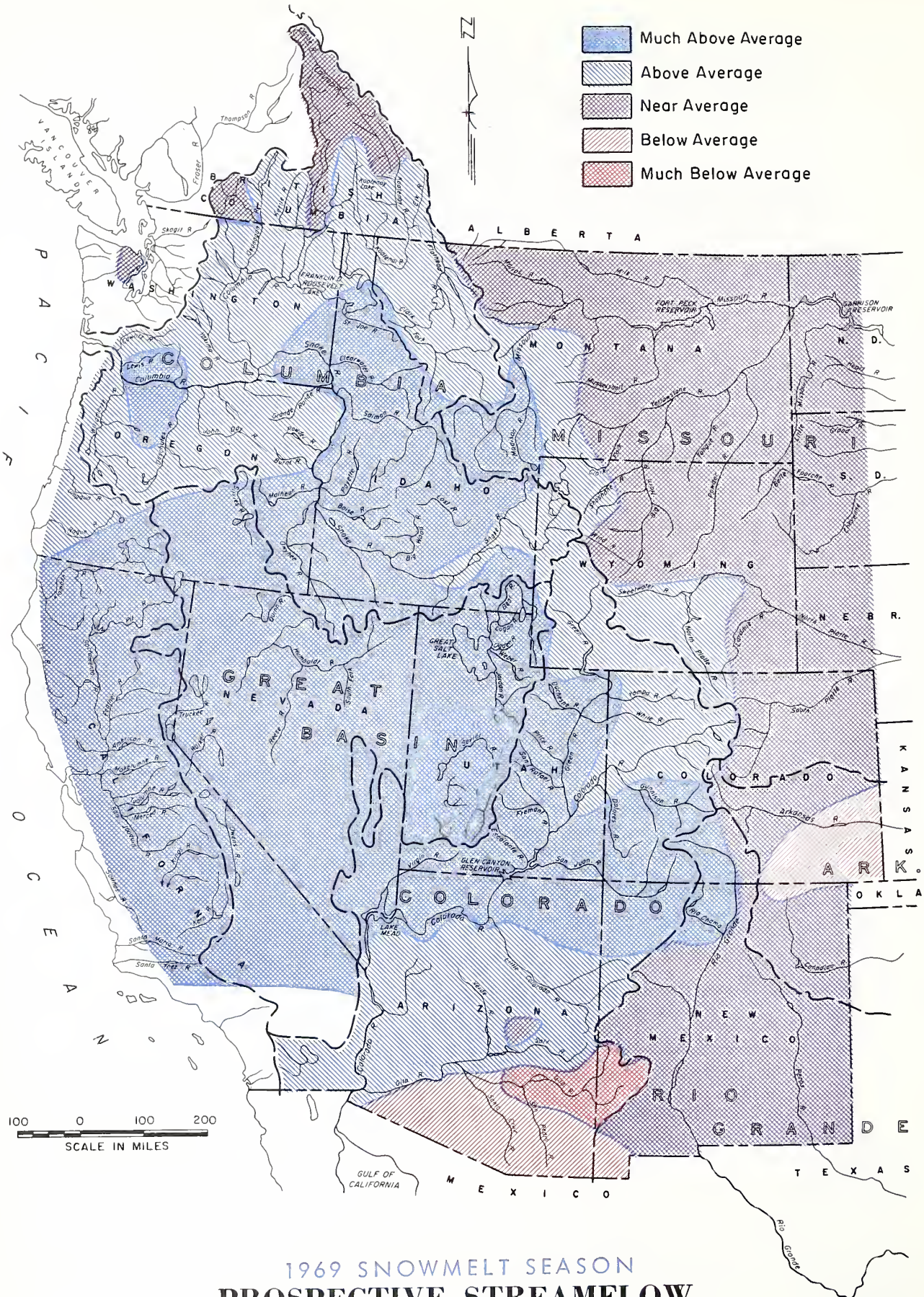
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR



1969 SNOWMELT SEASON

PROSPECTIVE STREAMFLOW

AS OF MARCH 1, 1969

USDA-SCS-PORTLAND, OREG. 1968

WATER SUPPLY OUTLOOK

1969 SNOWMELT SEASON
AS OF MARCH 1, 1969

RECORD TO NEAR RECORD SNOWPACKS THREATEN MANY HIGH WATER PROBLEMS WHEN SPRING SNOWMELT BEGINS. EXCEPT FOR ARIZONA'S GILA RIVER AND COLORADO'S PURGATOIRE RIVER WHERE SHORTAGES ARE EXPECTED, WATER SUPPLIES SHOULD BE FAIR TO EXCELLENT IN WESTERN STATES.

Deep snowpacks throughout most of the west give promise of one of the best irrigation seasons in years. However, they also threaten high water damage in many sections of California, Nevada, Utah, southern Idaho and in limited areas of Oregon, Washington, Montana and Colorado. Reservoir storage is generally above average, but is being reduced in many places to provide added storage space for river regulation. The only areas faced with the prospect of water shortages are along the upper Gila river in Arizona and the Purgatoire river, a southern tributary to the Arkansas river in Colorado. These streams are forecast to flow at about 60 to 65 percent of average.

Heavy buildup of the snowpack continued during February in the mountains of California, Nevada, Utah and in southeastern Oregon, southwestern Idaho and southern Colorado. In these areas forecasts of snowmelt season runoff have been increased sharply for most streams, and are generally 20 to 50 percent higher than a month ago. On some low elevation watersheds in California, Nevada, and southwestern Idaho, the forecasts are now 100 to 200 percent higher than on February 1st.

Most mountain streams in the above designated areas are expected to yield spring flows ranging between 150 to 300 percent of average. Some low elevation watersheds will produce flows from three to near five times normal amounts. Streambank erosion and overbank inundation of agricultural lands is anticipated on streams without reservoirs, or where reservoir capacities are insufficient to properly regulate the flows. This applies particularly to many smaller streams. Some users may experience a water shortage due to washed out diversion structures.

The California Department of Water Resources reports that the wet regime firmly established during January persisted throughout February, further assuring California water users of abundant supplies. Continuous storms during the month have produced record and near record snowpack conditions in Sierra watersheds and thoroughly drenched most other regions of the State. Many counties in Southern California have been declared disaster areas. Critical conditions could also develop in the Tulare Lake Basin of the Lower San Joaquin Valley which will be deluged in coming months by the greatest snowmelt runoff of record.

February snowfall along the Continental Divide in Wyoming and northern Colorado was generally near but below average. On the upper Green river in Wyoming it was above average. Snows were more variable in Washington, Montana and in northern sections of Oregon and Idaho. Most areas in these states reported below average amounts for the month. Although the snowpack continues heavy in the United States portion of the Columbia Basin, it decreases northward across British Columbia to a near average condition on the upper Columbia and Kootenai rivers.

The Missouri river has record and near record snow on the Red Rock and Madison rivers, but snows decrease to a near average condition north and east of here. It is near average on streams such as the Marias near the Canadian border. Flow of the Yellowstone river, with its Wyoming tributaries, is expected to be about 5 to 15 percent above average. While inflow to the main reservoir system on the North Platte river will be near 20 percent above average, its lower tributaries -- along with those of the South Platte -- are expected to provide average to 15 percent less than average amounts.

Water supply for the upper Arkansas river will be good, with near 10 percent above average flow expected. Flow of the Pecos and Canadian rivers will be near average, while the Rio Grande will have excellent supplies.

Forecasts for streams in the Upper Colorado river basin range from a low of 103 percent of average for the Colorado river at Dotsero to a high of 326 percent for the Virgin river in Utah. Total inflow to Lake Powell from the upper basin is forecast at 139 percent for the April-July period.

Except for the Gila river as noted above, water supplies will also be excellent throughout the lower Colorado basin.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS MARCH 1, 1969

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	124	153
Madison	139	143
Gallatin	80	114
Missouri Main Stem	101	129
Yellowstone	94	117
Shoshone	139	112
Wind	99	103
North Platte	100	109
South Platte	77	88
ARKANSAS BASIN		
Arkansas	89	97
Canadian	89	110
RIO GRANDE BASIN		
Rio Grande (Colo.)	114	119
Rio Grande abv.Otowi Bridge	131	101
Pecos	102	129
COLORADO BASIN		
Green (Wyo.)	133	114
Yampa - White	101	108
Duchesne	182	197
Price	162	188
Upper Colorado	107	111
Gunnison	121	128
San Juan	128	141
Dolores	113	108
Virgin	200	343
Gila	32	104
Salt	62	152
GREAT BASIN		
Bear	144	135
Logan	130	118
Ogden	185	171
Weber	158	166
Provo - Utah Lake	171	188
Jordan	150	159
Sevier	140	196
Walker - Carson	370	250
Tahoe - Truckee	250	225
Humboldt	283	166
Lake Co. (Oregon)	297	187
Harney Basin (Oregon)	316	150
UPPER COLUMBIA BASIN		
Columbia (Canada)	101	98
Kootenai	161	126
Clark Fork	125	126
Bitterroot	119	116
Flathead	147	118
Spokane	183	126
Okanogan	137	122
Methow	154	154
Chelan	121	123
Wenatchee	305	201

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	126	118
Snake above Hiese, Idaho	125	121
Snake abv.American Falls Res.	133	132
Henry's Fork	167	172
Southern Idaho Tributaries	172	131
Big and Little Wood	229	193
Boise	210	165
Owyhee	690	217
Payette	183	149
Malheur	246	151
Weiser	143	128
Burnt	200	145
Powder	133	116
Salmon	158	141
Grande Ronde	270	122
Clearwater	141	119
LOWER COLUMBIA BASIN		
Yakima	237	151
Umatilla	540	136
John Day	269	134
Deschutes - Crooked	235	131
Hood	480	175
Willamette	287	148
Lewis	285	161
Cowlitz	368	144
PACIFIC COASTAL BASIN		
Puget Sound	398	150
Olympic Peninsula	154	144
Umpqua - Rogue	268	172
Klamath	248	165
Trinity	225	200
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	175	140
Feather	190	170
Yuba	205	175
American	235	175
Mokelumne	240	180
Stanislaus	310	200
Tuolumne	270	200
Merced	270	205
San Joaquin	355	230
Kings	470	280
Kaweah	470	280
Tule	580	290
Kern	460	720

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1953-67 period. California averages are for the period 1931-65.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

MISSOURI BASIN

Snowpack readings along the Montana-Idaho border are record high on the Red Rock river headwaters, near record high on the Madison river and above average on the remainder of the upper Missouri river headwater area. The Musselshell, Sun, Teton and Marias rivers have near average mountain snowpack. Flow of the Red Rock river is forecast to exceed all flows of the past 30 years of record, while the Madison river forecast is for a flow equalling previously recorded maximum flows. Downstream tributaries should produce near average flows.

The Yellowstone river and its tributaries above confluence with the Bighorn river have above average snow, which should yield 5 to 15 percent more than usual streamflow. Snow cover is near normal on the Wind and Shoshone rivers, but falls below average in the Big Horn mountains. While flow of the Bighorn river is forecast to be near average, the Little Bighorn will be about 10 percent less than normal.

Inflow to the major reservoirs on the North Platte is expected to be about 20 percent above average. Flow of the Laramie river should be slightly above average. Reservoir storage continues above average and is greater than last year. Water supplies should be good.

A drier than usual February dropped forecasts for the South Platte river in Colorado, but streamflow prospects are still within 10 to 15 percent of average. When combined with present above normal reservoir storage the water outlook is still good and should meet normal demands.

ARKANSAS BASIN

The upper Arkansas river above Salida, Colorado has an above average snow cover which should yield about 10 percent above normal flows. Snow cover falls off rapidly on southern tributaries, resulting in a poor outlook as exemplified by the forecast of 65 percent of average for the Purgatoire at Trinidad, Colorado. With poor reservoir storage along the Arkansas river, greater than normal snowfall for the balance of the season is needed to guarantee adequate water supplies this summer.

In New Mexico, February storms brought an improvement in snow cover on the Canadian river. Its flow is now expected to be near average. However, with storage in Conchas reservoir at 76 percent of average, additional greater than normal storms would be welcome.

RIO GRANDE BASIN

Above normal snowfall during February improved prospects for the summer's water supply. Now, the entire Rio Grande basin, including the Pecos river, is expected to experience average or better streamflow. At 158 percent, the snowpack on the Rio Chama is highest in the basin. Snow on the upper Rio Grande in Colorado is near 20 percent above normal, and is near average or above elsewhere.

Reservoir storage on the main stem of the Rio Grande is slightly less than average, and 10 percent more than last year. Combined storage in Alamagordo, McMillen and Avalon reservoirs in the Pecos Basin is about 90 percent of last year and 80 percent of average.

COLORADO BASIN

With the exception of northwestern Colorado on the White and Yampa rivers, February snowfall was above average throughout the entire Colorado river, both upper and lower basins. The only place where water shortages are anticipated this year is in the upper Gila river valley in Arizona, where considerable pumping will be required. Throughout the remainder of the basin, water supplies will be good to excellent.

The present snowpack is near 150 percent of previous March 1st records on the Virgin river in southern Utah and is already at or above previous maximum readings recorded any time of year. Numerous snow courses are at or near record high March 1st readings on the Duchesne and Price rivers in Utah and the Gunnison river in Colorado. Snow cover is also extremely high on the San Juan, Animas and San Rafael rivers.

The snowpack falls off to about 10 or 15 percent above average on the upper Colorado, the White and Yampa rivers and the Green river in Wyoming.

Streamflow forecasts in the upper basin vary from a low of 103 percent on the Colorado at Dotsero to a high of 326 percent on the Virgin river. Storage in irrigation reservoirs remains above average. Contents of the Colorado River Storage Project reservoirs were 10,135,730 acre-feet at the end of February, or 32 percent of capacity.

In Arizona the Salt and Verde rivers are forecast to yield about 20 percent above average amounts. Reservoirs on these two rivers hold 150 percent to over 400 percent of normal amounts.

GREAT BASIN

Excellent water supplies are assured for all parts of the Great Basin, unless high snowmelt water washes out diversion works. This is a distinct possibility in areas where the snowpack is already at or exceeding previous record high readings, and where reservoir storage is

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER 1969 as of MARCH 1, 1969

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
UPPER MISSOURI	1968	1969	
Jefferson at Sappington, Montana	1039	1570	166
Madison near Grayling, Montana 1/	522	600	139
Gallatin near Gateway, Montana	641	600	130
Missouri near Landusky, Montana 2/		5750	128
Sun at Gibson Dam, Montana 3/	429	580	96
Marias near Shelby, Montana 4/	409	590	98
Milk near Eastern Crossing, Montana	303	285	101
Yellowstone at Yellowstone Lake Outlet, Wyo.(Apr.-Oct.)		970	116
Yellowstone at Corwin Springs, Montana	2103		
Clark Fork at Chance, Montana	569	615	106
Shoshone, Inflow to Buffalo Bill Res., Wyo.		890	110
Wind at Dubois, Wyoming		107	107
Bull Lake near Lenore, Wyoming		187	105
Tensleep near Tensleep, Wyoming		70	95
Yellowstone at Miles City, Montana 5/		6325	108
Missouri near Williston, N. Dakota 6/		12900	117
PLATTE			
North Platte at Saratoga, Wyoming		671	121
Laramie near Jelm, Wyoming 7/		110	106
Clear at Golden, Colorado		116	98
St. Vrain at Lyons, Colorado		58	83
Cache LaPoudre near Fort Collins, Colorado 8/		195	91
ARKANSAS			
Arkansas at Salida, Colorado 9/		338	109
Purgatoire at Trinidad, Colorado		30	65
RIO GRANDE			
Rio Grande near Del Norte, Colorado 10/		450	103
Conejos near Mogote, Colorado 11/		270	148
ElVado Res. Inflow, New Mexico		300	160
Rio Grande at Otowi Bridge, New Mexico 12/		650	126
Pecos at Pecos, New Mexico		41	100
UPPER COLORADO			
Granby Res. Inflow, Colorado 13/		245	112
Colorado at Dotsero, Colorado 14/		1420	103
Roaring Fork at Glenwood Springs, Colorado 15/		850	123
Gunnison at Grand Junction, Colorado 16/		1450	128
Dolores at Dolores, Colorado		355	154
Colorado near Cisco, Utah 16/**	3653	3530	126
Flaming Gorge Res., Utah, Net Inflow 17/**	1061	1390	132
Yampa at Steamboat Springs, Colorado		325	125
White at Meeker, Colorado		330	113
Duchesne near Tabiona, Utah 18/**	116	155	167
Whiterocks near Whiterocks, Utah **	75	82	161
Scofield Reservoir, Utah, Net Inflow 19/ **	45	76	206
Green at Green River, Utah 17/**	1796	3660	142
Navajo Reservoir Inflow, New Mexico	591	920	149
Animas at Durango, Colorado		560	137
San Juan near Bluff, Utah 20/**	923	1305	147
Colorado, Inflow to Lake Powell, Arizona 21/**	7247	9060	139
LOWER COLORADO			
Gila near Solomon, Arizona (March-May)	286	42	58
Salt at Intake, Arizona (March-May)	410	240	118
Verde above Horseshoe Dam, Arizona (March-May)	127	127	120

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER 1969 as of MARCH 1, 1969

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
GREAT BASIN	1968	1969	
Bear at Harer, Idaho	202	371	164
Logan near Logan, Utah 22/ **	99	126	127
Ogden, Inflow to Pine View Res., Utah 23/ **	94	200	213
Weber near Oakley, Utah **	136	162	150
Utah Lake, Utah, Net Inflow **		340	174
Big Cottonwood near Salt Lake City, Utah **	38	50	187
Beaver near Beaver, Utah **		31	191
Sevier near Hatch, Utah **	56	74	224
Humboldt at Palisades, Nevada **	81	320	211
Truckee at Farad, California 26/ **	155	573	222
East Carson near Gardnerville, Nevada **	120	375	214
West Walker near Coleville, California **	96	290	203
UPPER COLUMBIA			
Columbia at Revelstoke, British Columbia(Mar-Sept.)		17940	96
Kootenai at Wardner, British Columbia (Mar-Sept.)		5000	100
Kootenai at Leonia, Idaho	7901	10790	118
Flathead near Polson, Montana 27/	6438	9050	117
Clark Fork above Missoula, Montana	1434	2170	123
Bitterroot near Darby, Montana	548	700	125
Clark Fork at Plains, Montana 27/	10419	15120	121
Columbia at Birchbank, British Columbia 27/	46362	49100	106
Spokane at Post Falls, Idaho 28/	1697	4100	131
Columbia at Grand Coulee, Washington 27/	62649	78760	113
Okanogan near Tonasket, Washington		1910	110
Chelan at Chelan, Washington 29/		1460	115
Wenatchee at Peshastin, Washington	1530	2050	113
SNAKE			
Snake above Palisades Res., Wyoming 30/		3040	119
Snake near Heise, Idaho 30/	3903	4400	118
Henry's Fork near Rexburg, Idaho 31/		740	122
Big Lost near Mackay, Idaho 32/		300	179
Big Wood, Inflow to Magic Res., Idaho 33/(Mar-July)		640	239
Bruneau near Hot Springs, Idaho		280	146
Owyhee Res., Net Inflow, Oregon	92	844	281
Boise near Boise, Idaho 34/	945	2500	161
Malheur near Drewsey, Oregon	14	115	160
Payette near Horseshoe Bend, Idaho 35/	1077	2700	147
Snake at Weiser, Idaho	4227	9000	143
Salmon at Whitebird, Idaho	5626	8900	130
Clearwater at Spalding, Idaho	6670	10500	122
LOWER COLUMBIA			
Grande Ronde at LaGrande, Oregon		185	106
Yakima at Cle Elum, Washington 36/		1120	116
Deschutes at Benham Falls, Oregon 37/		520	87
Columbia at The Dalles, Oregon 27/	88530	124300	118
Hood near Hood River, Oregon 37/		444	132
Willamette at Salem, Oregon 37/		5940	114
Lewis at Ariel, Washington 38/		1750	129
Cowlitz at Castle Rock, Washington		3320	118

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER 1969 as of MARCH 1, 1969

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
	1968	1969	
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington		180	105
Rogue at Raygold, Oregon		1025	109
Klamath Lake, Net Inflow, Oregon		775	125
CALIFORNIA CENTRAL VALLEY 38/**			
Sacramento, Inflow to Shasta, California		2600	149
Feather near Oroville, California		4100	220
Yuba at Smartville, California		2080	191
American, Inflow to Folsom Res., Calif.		2550	192
Cosumnes at Michigan Bar, California		250	195
Mokelumne, Inflow to Pardee Res., Calif.		930	200
Stanislaus, Inflow to Melones Res., Calif.		1440	203
Tuolumne, Inflow to Don Pedro Res., Calif.		2500	212
Merced, Inflow to Exchequer Res., Calif.		1300	217
San Joaquin, Inflow to Millerton Lake, Calif.		3050	260
Kings, Inflow to Pine Flat Res., California		2900	250
Kaweah, Inflow to Terminus Res., California		700	268
Tule, Inflow to Success Res., California		200	357
Kern, Inflow to Isabella Res., California		1900	451

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1916-65.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.
** April - June Period ** April - July Period*

non-existent or insufficient to allow adequate river regulation.

Most streams are forecast to yield from about 140 to 300 percent of average amounts. Reservoirs, which already hold above average amounts, are in many instances being drawn down to create a cushion for the high flows to come when the spring snowpack melts.

April-July inflow to Utah Lake is forecast at 340,000 acre-feet (174 percent average). With compromise level expected to be reached before April 1, the lake level should reach a maximum of near 2.0 feet above compromise by mid-May. Extensive flooding around the lake is likely where no protection is present. Minor flood problems are expected along the Jordan river.

Numerous snow courses in the Sierra Nevada, Springs Mountains and Lower Humboldt area already have more snow than ever before recorded. Most previous records were set the first of April, 1952. Since the snowpack ordinarily continues its buildup during March and sometimes April in cold years, this year's maximum readings may reach as much as 125 to 150 percent of previous record high readings.

Mountain soils are generally wetter than average and will add to the volume and speed of runoff when the snowpack melts.

COLUMBIA BASIN

Good to excellent water supplies are expected for all sections of the Columbia Basin this year.

February snowfall was variable throughout the basin, with only southeastern Oregon, southwestern Idaho areas showing substantial snowpack increases.

The British Columbia Water Resources Service reports the March 1st snowpack to be quite variable, ranging from well above average on the lower Kootenai to below average in the upper Fraser and Peace river regions. Snowpacks are above average on the Okanogan and South Thompson and close to average on the Similkameen and North Thompson. In general, snowpacks are heaviest in southern areas near the international boundary.

The mountain snowpack is above average throughout the Montana portion of the Columbia river. Lowest is the Bitterroot drainage with

116 percent, while the upper Clark Fork is highest with 132 percent. Streamflow on the Whitefish, Stillwater, Fisher, Little Bitterroot, Thompson and St. Regis rivers is expected to be about 20 to 25 percent above average, and reflect the influence of heavy low elevation snowpack. Flathead river tributaries are lower, reflecting the influence of the high elevation snowpack which is 5 to 15 percent above average.

Washington's snowpack is also particularly heavy at low elevations. Statewide, the snowpack ranges from about 140 to over 200 percent. Streamflow forecasts range from 105 percent on the Similkameen and Dungeness rivers to 140 percent on the Colville river. While streams in Washington are expected to flow at above average amounts, they are not expected to reach record proportions.

The snowpack in Idaho poses an extremely serious high water potential on many low elevation streams, particularly in southern areas where there is a distinct possibility of overtopping reservoirs on a number of smaller rivers. Many medium elevation snow courses have recorded a record snowpack. Snowmelt season forecasts for the Snake river and its tributaries range from 118 percent on the Snake near Heise to 239 percent on the Big Wood river (Magic reservoir inflow) and 281 percent for inflow to Owyhee reservoir.

The Oregon snowpack already equals April 1st averages in all parts of the state. Some snow courses have exceeded previous maximum readings. Lowest forecast is for the Deschutes at Benham Falls with 87 percent average expected. This forecast reflects the heavy, year to year carryover effect of base flow on this stream. Except for the Deschutes and Owyhee noted above, forecasts for the Oregon streams range from 106 percent for the Grande Ronde near La Grande to 160 percent for the Malheur near Drewsey.

ALASKA

Heavy snowfalls were recorded in portions of the Chugach Mountains and in Southeast Alaska during the month of February. Snow cover is slightly above average in these portions of the state.

Very little additional snow fell in the interior of Alaska during the month. Snowpack is very deficient on the Susitna, Copper, Tanana, and Upper Yukon watersheds. Snow densities are also light as a result of an unusually cold Winter.

Soils are generally dry throughout the interior region. It is expected that a considerable portion of the spring snowmelt will be absorbed into the soil, and early summer streamflow will be less than normal.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that the 1968-69 water year will rank with the wettest years of record. Water content of the Sierra snowpack on the first of March, as determined from key snow courses and snow sensors, shows that there has been as much as a 50 percent increase over that measured one month ago and is approaching or exceeding the record years of 1938, 1952, and 1967.

Almost continuous precipitation during January and February has caused most of the State's major reservoirs to fill to flood control reservations. In the Tulare Lake Basin, much of this reservation has been used to control runoff from intense storms and, as a consequence, critical conditions are anticipated during the snowmelt runoff season. Because of the flood potential from snowmelt, large controlled releases have been in progress for some time and will continue through the snowmelt period. With present downstream flows at or near maximum channel capacity, water agencies in the San Joaquin Valley are coordinating their activities to handle the unusually large volumes of water that must be controlled. The problems are further compounded because of the saturated valley floor which has delayed the start of normal agricultural activities.

There was storm activity over most of the State during each of the four weeks of February. Thus, precipitation throughout California during February was well above normal except in the extreme north and the Colorado Desert area. Statewide precipitation for the month was 190 percent of normal. The most productive storms of February occurred during the last week, boosting the flows in all basins to new peaks. In the South and Central Coastal areas this storm brought on new mud slides and forced evacuation of some areas in addition to increasing the number of storm-caused deaths. In the Central Valley, precipitation for Sierra watersheds ranged from 160 percent of normal in the north to about 300 percent of normal in the south.

March 1 surveys indicate that with normal snow accumulation during March, the snowpack in most Sierra basins will be the maximum of record. In the Kern River watershed, all snow survey reports show that the snowpack in the basin is already the greatest ever recorded in the forty years that snow samples have been taken. Statewide, the snowpack water content was 235 percent of the March 1 average or 200 percent of the April 1 average. In the Central Valley, the water content ranges from a high of 340 percent on the Kern River watershed to 225 percent of the March 1 average for the Tuolumne River watershed.

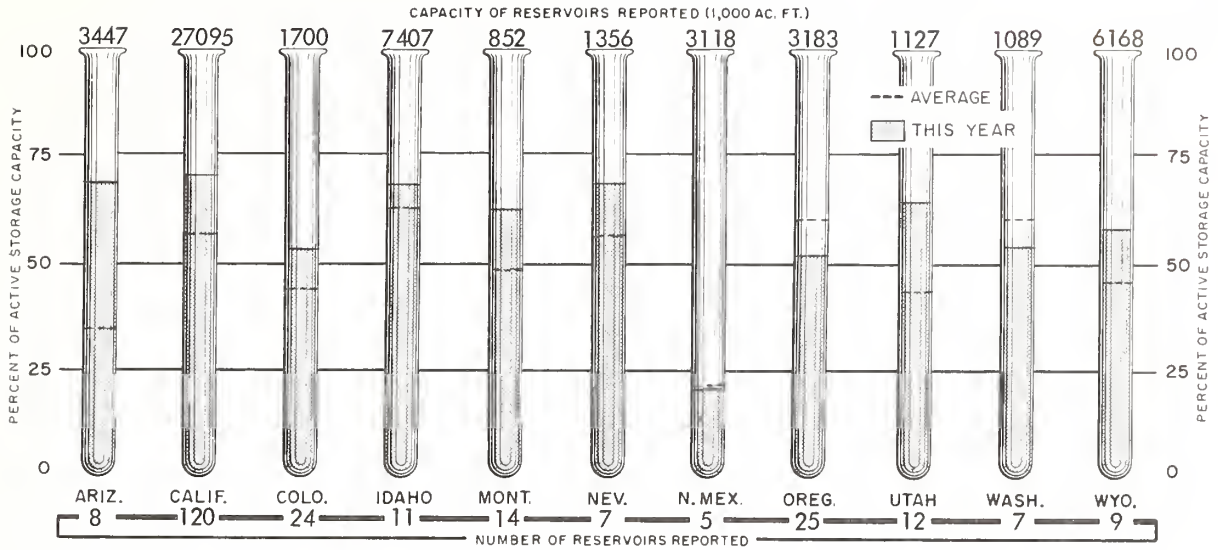
STORAGE IN LARGE RESERVOIRS MARCH 1, 1969

BASIN AND NAME OF RESERVOIR	CAPACITY (1000A.F.)	STORAGE (1000A.F.)
UPPER MISSOURI		
Belle Fourche	185	107
Boysen	550	346
Buffalo Bill	373	174
Canyon Ferry	2043	1586
Fort Peck	19410	15970
Garrison	24500	18734
Hebgen	377	300
Keyhole	340	117
Lake Francis Case	5816	3080
Lake Sharp	1900	1723
Oahe	23630	19765
Tiber	1347	448
Yellowtail	1356	720
PLATTE		
City of Denver	507	423
Colo-Big Thompson (3)	718	336
Glendo	784	400
Pathfinder	1016	353
Seminoe	1011	421
ARKANSAS		
Conchas	273	124
John Martin	354	16
RIO GRANDE		
Elephant Butte	2195	406
El Vado	195	1
UPPER COLORADO		
Blue Mesa	830	422
Flaming Gorge	3749	1669
Navajo	1696	707
Powell	25002	7337
LOWER COLORADO		
Havusu	619	549
Mead	27207	15471
Mohave	1810	1660
Salt River Res. (4)	1755	1523
San Carlos	1206	475
Verde River Res. (2)	318	235
GREAT BASIN		
Bear	1421	1066
Lahontan	287	202
Rye Patch	172	42
Sevier Bridge	236	129
Strawberry	265	154
Tahoe	732	630
Utah	1149	847
Willard Bay	198	124

BASIN AND NAME OF RESERVOIR	CAPACITY (1000A.F.)	STORAGE (1000A.F.)
UPPER COLUMBIA		
Chelan	676	166
Coeur d'Alene	225	85
Duncan	1347	425
Flathead	1219	426
Hungry Horse	2982	2043
Kootenay	673	292
Lower Arrow	3083	512
Pend Oreille	1155	609
Roosevelt	5232	141
Upper Arrow	4061	460
LOWER COLUMBIA		
Cougar	155	8
Detroit	299	0
Hills Creek	200	0
Lookout Point	337	8
Yakima Res. (5)	1066	685
SNAKE		
American Falls	1700	1283
Anderson Ranch	423	187
Arrowrock	287	181
Brownlee	980	495
Cascade	653	312
Jackson	847	653
Lucky Peak	278	43
Owyhee	715	358
Palisades	1202	1021
PACIFIC COASTAL		
Clair Engle	2500	1585
Clear Lake	440	203
Nacimiento	350	365
Ross	1052	617
Upper Klamath	465	414
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	638
Berryessa	1602	1662
Folsom	1010	599
Isabella	570	256
McClure	1026	713
Millerton	521	360
Oroville	3484	2757
Pine Flat	1013	819
Shasta	4500	3197

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

RESERVOIR STORAGE as of MARCH 1, 1969



March 1 forecasts of April-July runoff from Sierra watersheds increased about 25 percent over those of February 1. The latest forecasts, based upon the assumption that normal precipitation will occur during the remainder of the season, range from 150 percent of normal for the Sacramento River inflow to Shasta to 450 percent of normal for the Kern River Basin.

Although not approaching the record flows of January, incredible runoff volumes again occurred in the coastal regions of Southern California, with index streams averaging about 800 percent of normal for the month or 185 percent of that expected for the entire water year. Runoff of Sacramento Valley and San Joaquin Valley streams was also high, averaging about 170 percent and 250 percent of normal, respectively. Aggregate February runoff from California watersheds was about 170 percent of normal bringing the season-to-date total to about 200 percent of normal.

Although most major reservoirs in California are maintaining their flood control reservations, some San Joaquin Valley reservoirs are still encroaching on this space. As of March 1, 120 of California's reservoirs were storing 18,820,000 acre-feet. This is 70 percent of their aggregate capacity, 125 percent of their 10-year average, and reflects a net storage gain during the year of about 2,000,000 acre-feet.

U.S. DEPARTMENT of AGRICULTURE
SOIL CONSERVATION SERVICE
CONSERVATION OF WATER BEGINS WITH THE SNOW SURVEY

IMPORTANT NOTICE !

If you wish to continue receiving this report, return card as noted below

U. S. SOIL CONSERVATION SERVICE
701 N. W. GLISAN - ROOM 209
PORTLAND, OREGON 97209

IMPORTANT NOTICE

IF YOU WISH TO CONTINUE TO RECEIVE THE WESTERN UNITED STATES WATER SUPPLY OUTLOOK REPORT, PLEASE SIGN AND RETURN THIS CARD, MAKING NECESSARY CORRECTIONS IN THE ADDRESS AS SHOWN. IF THIS CARD IS NOT RETURNED IN 30 DAYS WE ARE REQUIRED TO REMOVE YOUR NAME FROM THE FREE MAILING LIST.

IF MORE THAN ONE COPY IS DESIRED, CHECK NUMBER HERE

☐ WATER SUPPLY OUTLOOK REPORT

☐ BASIC DATA SUMMARY

(SIGNED) ____________________ (DATE) ____________________

WSF-2

USDA-SCS-PORTLAND, OREG. 1965
M-4044

PLACE
STAMP
HERE

POSTAL CARD

U. S. SOIL CONSERVATION SERVICE
Water Supply Forecasting Branch
701 N. W. Glisan Room 507
Portland, Oregon 97209

EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
701 N.W. GLISAN, RM. 209
PORTLAND, OREGON 97209

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U. S. DEPARTMENT OF AGRICULTURE

FIRST CLASS MAIL

FEDERAL - STATE - PRIVATE

COOPERATIVE SNOW SURVEYS

Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation , navigation , mining and industry

"The Conservation of Water begins with the Snow Survey"